

yielding so many interesting and striking results.—The *Mineralogische Mittheilungen*, which, under the editorship of Dr. Tschermak now forms such a valuable portion of the *Jahrbuch*, contains an article by Dr. Hirschwald "Zur Kritik des Leucit-systems," which is sure to be eagerly read, now that so much attention has been excited on this question by the memoirs of von Rath and Scacchi.—Dr. Brezina's contribution to the question of isomorphism, especially in its bearing on the classification of the feldspars, is not yet completed, but promises to be one of great importance and suggestiveness.—Dr. Drasche, who, on his way to the Malay Archipelago, whither he is gone to study the volcanic phenomena of that area, has visited the island of Bourbon, sends home an interesting communication concerning its geology, which is also published in the *Mineralogische Mittheilungen*.

Gazzetta Chimica Italiana, Anno vi. 1876, fasc. iii.—A considerable portion of this number is taken up by an account of the researches of E. Paterno, of the University of Palermo, on usnic acid as derived from *Zeora sordida*. His investigations induce him to adopt the formula $C_{18}H_{18}O_7$, in preference to those adopted by Stenhouse, Hesse, and others who have interested themselves in this body. In deriving usnic acid from the above source, the investigator discovered two new substances which were invariably present, although in exceedingly small quantities. To these he has given the names zeorin and sordidin (zeorina e sordidina), and assigned the formulæ $C_{18}H_{18}O_7$ to the former, and $C_{18}H_{18}O_7$ to the latter.—G. Koerner contributes a paper on the constitution of veratric acid and veratrol. The same investigator, conjointly with G. Monselise gives an interesting account of two benzol-bisulphuric acids, and of their relations with other compounds.—In addition to the foregoing, an extract from an account of Prof. F. Selmi's research on atropine is given, and a paper by R. Schiff on the product obtained by bringing into contact with each other acetylic chloride and acetic aldehyde.—F. Sestini furnishes a paper on ethyl santonate, and a few extracts from other chemical journals complete this serial.

Journal de Physique, April.—M. Cazin here gives an outline of his recent researches on the thermal effects of magnetism. The three methods are described by which he measured the calorific effects produced in the core, also his mode of measuring the magnetic quantities, with the electrodynamic balance. In the case of a bi-polar tubular core, the quantity of magnetism alone being varied, by changing the intensity of the current, the quantities of heat generated by intermittences of the current are proportional to the squares of the quantities of magnetism alternately gained and lost by the core. The polar interval alone being varied, by altering the length of the core, the quantities of magnetic heat are proportional to the polar intervals, and consequently to the magnetic moments. In the case of a multi-polar tubular core, the successive polar intervals being equal, the quantities of heat generated in the core by the same interrupted current are inversely proportional to the squares of the number of intervals.—The Bureau des Longitudes decided in May last year to rectify annually the Magnetic Map of France; and in this number are shown the isogonic lines, degree by degree, as deduced from last year's observations. There is also a table of the principal towns in France, with the declination and annual variation for each.—A note by M. Potier treats of the conveyance of luminous waves by ponderable matter in motion.—We further note an abstract of researches by MM. Angström and Thalen, on the spectra of the metalloids. They affirm that carbon has only one spectrum, a spectrum of lines; the other spectra attributed to it are due to compound bodies. The same with nitrogen.

SOCIETIES AND ACADEMIES

LONDON

Geological Society, June 21.¹—Prof. P. Martin Duncan, F.R.S., president, in the chair.—12. On the mechanism of production of volcanic dykes and on those of Monte Somma, by R. Mallet, F.R.S. The author stated that in 1864 he made a careful trigonometrical survey of the escarpment of Monte Somma, especially with reference to the numerous dykes by which the rocks composing it are intersected. He described in detail the phenomena of direction of the dykes, especially as regards the axis of the cone of Vesuvius; to this direction he gives the name of *orientation*. Of twenty-seven

dykes ten presented an approximately vertical line, whilst all the rest had a sensible dip or "hade." The dykes are in no cases intersected by coherent beds of lava, but in one instance the top of a dyke was stopped by such a bed. Many of the dykes bifurcated or branched, and frequently two dykes intersected each other at considerable angles. These and other circumstances prove that the dykes were produced at different and successive ages. Many of them were fractured and displaced in consequence of movements of the mass of rock traversed by them; and these dislocations are regarded by the author as indicating the vast extent and force of the internal movements, due principally to gravity, which are constantly taking place in the mass of volcanic cones. These movements greatly influence the position of the dykes, and render it difficult to ascertain that which they originally occupied. The dykes thin out at various heights, and their superior and northern terminations were found not to reach the existing surface, notwithstanding the amount of denudation that has taken place; and hence the author concludes that they never reached the surface of Somma, when it was the wall of an active volcano. The author further indicated a process by which beds or plates of lava descending the slopes of a volcano may change their direction, and becoming embedded in the detritus accompanying or following them, may, to a greater or less extent, simulate dykes, although in this case the two sides of the plate will present the differences always seen in the upper and under surfaces of a bed of lava. The orientation-lines of five or six of the observed dykes were said to pass approximately through the axis of the cone of Vesuvius, but all the rest presented great diversities, and some, when prolonged, would not touch the cone at all. In making a lithological examination of the dykes of Somma, the author directed particular attention to the position of the elongated air-bubbles found in the material of each dyke, considering that the direction of the longest axis of these bubbles would indicate the flow of the material when in fusion. He stated that on the whole the long axes of the bubbles are nearly horizontal or pointing at moderate angles upwards in directions very nearly parallel to the plane of the dykes at the place where they occur. Hence he inferred that the dykes were filled by injection not from below but nearly horizontally. The author further referred to the mineralogical characters of the materials of the dykes, and stated that they are not all composed of leucitic lava; he also mentioned the occurrence of cross columnar structure in some of the larger ones. After referring to the differences observable in the physical condition of the two surfaces of some dykes, the author proceeded to consider the mode of origin of the fissures, which, when filled, constitute volcanic dykes. He maintained that the production of a fissure and its filling with molten matter must have been simultaneous and due to the same cause, namely, the hydrostatic pressure of the liquid lava more or less filling the crater, the pressure originating the fissure into which the pressing liquid at the same time enters; a fissure thus produced and filled will always be widest near the crater, so that if the material of the cone were perfectly uniform the dykes produced will be wedge-shaped. But from the absence of this uniformity and other causes, fissures commenced at the interior and propagated into the mass of volcanic cones can rarely be uniformly distributed round the crater or produced in regular vertical planes in a truly radial direction. Hence the author concluded that it is unsafe to attempt to fix the position of an ancient crater by means of the intersection or concurrence of the lines of apparent orientation of dykes alone. The author stated that the intrusion of volcanic dykes cannot so greatly influence the slope of volcanic mountains as has been supposed.—13. On the metamorphic rocks surrounding the Land's End mass of granite, by S. Allport. In this paper the author described the results of a microscopic examination of certain metamorphic rocks surrounding the Land's End granite, indicating the changes produced by the intrusion of the latter upon clay slate and upon certain igneous rocks. The slates in contact with granite become converted into tourmaline- and mica-schists, and are found to contain crystalline quartz, tourmaline, and three distinct varieties of mica, with occasionally tremalite, magnetite (and andalusite?), and in some localities feldspar. Their structure is also changed, the most remarkable changes being foliation with every gradation from nearly straight parallel lines to the most complicated contortions, and concretionary structure by segregation of quartz and mica, the result being a spotted schist. With regard to the origin of the granite of Cornwall, the author said that neither observation in the field nor microscopical study lends any support to the notion that it is a metamorphic rock; but, on the contrary, that there is the

¹ Continued from p. 282.

clearest evidence of former deep-seated volcanic action in the disturbance and alteration described in his paper, and in the enormous number of granitic and felsitic dykes intersecting the country for miles. The mode of occurrence of granite in other localities also seems to him to furnish evidence in the same direction.—14. On the relation of the upper carboniferous strata of Shropshire and Denbighshire to beds usually described as Permian, by D. C. Davies. The author stated his conviction that from the *Spirorbis*-limestone upwards to and including the Permian we have one continuous series of deposits.—15. Notes on the physical geography and geology of North Gippsland, Victoria, by A. W. Howitt. The earliest formation of which any trace is left in this district is the Silurian, all traces of any older rocks being removed, probably by the same agencies which have contorted and metamorphosed the Silurian slates and sandstones. The surface of all these Silurian strata show signs of great denudation previous to the deposition of the Devonian. The period that elapsed between these two epochs was one of volcanic activity, apparently sub-aerial and terrestrial, and representing the Lower Devonian. The Middle Devonian strata consist of shales and sandstones devoid of any traces of volcanic action, which, however, again becomes apparent in the Upper Devonian. The latter consists of conglomerates, sandstones, and shales, interstratified with aqueous deposits. The prevailing red colour of these beds the author suggests may possibly indicate lacustrine rather than marine conditions. The next in the series of deposits present in North Gippsland are of Tertiary age, and rest horizontally on the flanks of the mountains at elevations nowhere exceeding 1,000 feet. At the close of the Miocene and at the commencement of the Pliocene periods the land probably was from 300 feet to 400 feet lower than at present. The fact that different genera of fish are found in the streams flowing from the north and south sides of the Australian Alps indicate the high antiquity of that watershed. These mountains have been formed by the gradual elevation of the land *en masse*, and its equally gradual erosion by the streams and rivers.—16. Further notes on the Diamond Fields, &c., of South Africa, by E. J. Dunn. Communicated by Prof. A. C. Ramsay, F.R.S. These notes are intended to serve as additions and corrections to the author's paper read in 1873.—17. On Chesil Beach, Dorsetshire, and Cahore Shingle Beach, co. Wexford, by G. H. Kinahan, M.R.I.A., &c. Communicated by Prof. Ramsay, F.R.S., V.P.G.S. The author carefully compares the situations, structures, &c., of these two shingle beaches, and points out that their wonderful similarity is due to nearly the same natural causes in each case, but that at Chesil the driftage is due to the flow-tide current augmented by waves caused by the prevailing winds, while at Cahore the driftage is solely due to the flow-tide currents, its effects being modified by adverse wind-waves. The sorting of the pebbles on Chesil Beach is probably chiefly caused by the progressive increase in the velocity of the tidal current as it approaches the nodal or hinge-line of the tide in the English Channel. The author considers that the current due to the flow of the tide has greater drifting powers than wind-waves.—18. Some recent sections near Nottingham, by the Rev. A. Irving, B.A. The author describes a section of the strata exposed during the recent construction of a railway line from Carlton, three miles to the east of Nottingham, through Daybrook, to Kimberley.—19. On the Permians of the north-east of England and their relations to the under- and overlying formations, by E. Wilson. The author describes the same section as that noticed in the preceding paper.—20. The section at high force, Teesdale, by C. T. Clough.—21. The distribution of flint in the chalk of Yorkshire, by J. R. Mortimer, communicated by W. Whittaker. The author considers that the present shape of the Chalk Wolds of Yorkshire seems to suggest that they are the remains of an atoll or circular reef, probably one of a chain, rather than the fragment of a vast sheet of cretaceous mud deposited in deep water. He thinks that the flint-bearing and non-flint-bearing chalk areas are in the main contemporaneous in Yorkshire. The chalk without flint contains 4.28 per cent. of silica, whilst the chalk with flint contains only 2.12 per cent.—22. On the mode of occurrence and derivation of beds of drifted coal near Corwen, North Wales, by D. Mackintosh.—23. The Cephalopoda-beds of Gloucester, Dorset, and Somerset, by J. Buckman.—24. Evidence of the subsidence of the Island of Guernsey, by R. A. Peacock, C.E. All round the coast of this island, like that of Jersey, are found tree-trunks and other vestiges of old forest-land now submerged. Passages are quoted by the author from various old historians relative to the former existence of this tract as dry land, the submergence of which probably took place

in the fifteenth century. The encroachment of the waters is due to the subsidence of the land, and not, as has been suggested, to the breaking in of the sea through some natural barrier upon some already low-lying district. Judging from the old chart of 1406, the amount of depression is equal to 160 feet.

IOWA

Academy of Sciences, June 23.—Prof. C. E. Bessey, president, in the chair. The following papers were read:—A preliminary catalogue of the lichens of Iowa, by C. E. Bessey; also a preliminary catalogue of the orthoptera of Iowa, by Prof. Bessey.—Mounds and mound-builders, by Dr. P. J. Farnesworth, showing by comparisons in anatomical structure and modes of burial, that the present North American Indians are probably a remnant of the same race that built the mounds.—Dr. G. Hinrichs presented diagrams and maps, based on reports from his 100 Iowa weather stations, illustrating the very severe hailstorm in Iowa, April 12, 1876.—Prof. S. Calvin described seven new species of palæozoic fossils found in Iowa; also a probable new species of elephant found in the modified drift, near West Union. Prof. Calvin also gave notice of the occurrence of the Chemung group (N.Y.) in Iowa, and presented a preliminary notice of the occurrence of the marcellus shales in Iowa.—Prof. F. M. Witter presented notes on the land and fresh-water shells near Muscatine, Iowa.—Prof. W. C. Preston gave the "Thermic Wind Rose for Iowa City, based on three years' observations at Laboratory of Iowa State University."—Prof. Bessey read a note on the relations of light and heat to the colours of Iowa wild flowers.—Prof. Hinrichs showed that the waters from the deep-lying rocks of Iowa more nearly resemble the waters of the sea than the surface-waters. Prof. Hinrichs also exhibited a photograph of the Amana meteorite collection, made by him, which photograph is to accompany the catalogue he is preparing.

VIENNA

Imperial Academy of Sciences, Jan. 13.—The following, among other papers, were read:—Crystallographic-optical researches on some camphor-derivates, by M. von Zepharovich.—On the abdominal tympanal organs of the Cicada and Grilodeæ, by M. von Graber.—A contribution to the physiology of child-bed, by M. Kleinwächter. This refers mainly to the quantities of urine, urea, salt, and phosphoric acid secreted after giving birth, and the relation of such secretion to age.—On the changes wrought in epithelium through formation of sarcom, by M. Tauszky.—Some new form-elements in woody substances, by M. Möller. In a cross-section of *Avicennia africana*, e.g., he finds bright concentric circular lines, which the microscope shows to consist of regular parallelo-pipedal stone cells. Spiral thickening he finds in the libriform of *Protea ericoides*, hort.; so it is not confined exclusively, as Sanio says, to vascular formation. A peculiar arrangement of the parenchymatous elements of *Aquilaria Agallocha*, Reb., is also described.

Jan. 20.—On the heat developed or absorbed in change of volume of bodies, by M. Puschl. For the case of unilateral expansion or contraction of a solid, he gets an expression different from Thomson's formula, and agreeing with Edlund's hitherto unexplained results. He considers the second leading law of the mechanical theory of heat to be in general false, and to be superfluous in the special cases in which it seems confirmed by experience.—On starch-formation in chlorophyll granules, by M. Böhm. *Inter alia*, whatever light intensity suffices for decomposition of carbonic acid, causes also a passage of starch from the stalk into the chlorophyll granules.—Studies on the age of the more recent tertiary formations in Greece, by M. Fuchs.

Jan. 27.—Anatomical and histological notes on *Gibocellum*, a new Arachnid. In outer form it is closely allied to *Cyphophthalmus*, and in internal organisation it furnishes a transition from Phalangidæ to Cheraetidæ.—On the condition of equilibrium of a system of bodies with reference to gravity, by M. Loschmidt. It is shown that in some special systems, in the state of dynamic equilibrium, the mean *vis viva* of the molecules cannot everywhere be the same. Hence Maxwell's law of distribution, according to which this must be the case, cannot forthwith be extended to the case where external forces act on the constituent atoms of the system. The second law of the mechanical theory of heat is not thus invalidated, but certain deductions from it are.

Geological Society, Feb. 15.—The director, M. von Hauer, presented a paper by E. Hussak, of Leipsic, on the eruptive

rocks of Zálasy, near Krzeszowice, which break through sedimentary strata of Triassic age. The author, considering the microscopic structure of these rocks, argues that they are real Trachytes and not Porphyries, as was before supposed. This view is corroborated by the construction of the felspar in regular zones, enveloping one another, the numerous glass-cavities in the latter as well as in quartz, while there exist no fluid-cavities at all, and the abundance of glass and the want of quartz in the seemingly compact base.—Dr. G. A. Koch on the Arlberg tunnel. He showed four sheets of a large and detailed geological map on the scale of 1:2000, drawn from nature, representing the nearest environs of the tunnel line on the Arlberg, as it was marked out last summer, and illustrated it by a series of sections and specimen of rock. The whole mass of rock to be perforated by the tunnel belongs to the group of gneiss-phyllite, which just at the Arlberg changes into quartz-phyllite, wherein pure quartz abounds. The tunnel measures 6,470 metres in length, and attains its culmination in 1,423 metres above the sea, running always nearly parallel to the direction of the strata. This tunnel must be led somewhat more than 4.5 kilometres, or about 70 per cent. of its length, through a light-coloured gneiss, which may contain in the least favourable parts about one-fifth of pure quartz. Nevertheless the working of this rock will present no difficulties, as it contains a great deal of felspar, and the vaulting of the tunnel will only be necessary in a few localities where the slates of gneiss are exceptionally very thin. A little more than one kilometre, or about 15 per cent. of the length of the tunnel line passes a nod-slate (Knoten-Schiefer) similar in structure to gneiss, and easily wrought. Scarcely half a kilometre, or about 7 per cent. of the length, belongs to a very hard, small-laminated mica-schist, containing a great deal of quartz, and the rest, somewhat more than half a kilometre, or about 8 per cent. passes a ferruginous mica-schist, including garnets, that abounds more and more in quartz, when coming from Stuben, the Tyrol side of the Arlberg is reached. Dr. Koch also mentioned the difficulties arising from the direction of the strata and the dangerous influence of water in some parts, which are unfavourable to the construction of this tunnel. Finally, he stated that another newly proposed line, though it passes 10.5 kilometres in length directly through the crystalline rocks, would not only afford more security, but also would be less expensive, as the total length of the railroad would be diminished, and the management of it much easier, the culminating point of this longer tunnel lying 108 metres deeper than that of the shorter one.—Dr. R. Hörnes gave an account of his last summer's work. In Austrian countries he mapped the valleys of old and new Prax, Höhlenstein, and Sexter, then the eastern declivities of the Ampezzo Valley; in Italy he examined the valleys of Cadore, Auronzo, and Comelico. The detailed geological map presented by him comprises therefore nearly the same region, which Dr. H. Loretz had described in the Journal of the German Geological Society in 1874.—Mr. F. Gröger spoke about the occurrence of ores of antimony in the Isle of Borneo.

PARIS

Academy of Sciences, July 24.—Vice-Admiral Paris in the chair.—The following papers were read:—On observation of the infra-red part of the solar spectrum by means of the effects of phosphorescence, by M. Edm. Becquerel. Through two vertical slits in a shutter are admitted two beams of parallel solar rays. One beam, traversing a sulphide of carbon prism and a lens, gives a spectrum which is made to fall on a phosphorescent matter; the second beam passing through a white flint prism gives a spectrum, the ultra-violet part of which is thrown upon the infra-red part of the first spectrum. What occurs is this: In the infra-red part of the one spectrum, the impressionable matter excited by the ultra-violet rays has its phosphorescence destroyed, but unequally, giving an appearance of unequal illumination. Not all phosphorescent substances give the effect immediately, and some do not give it. The best substance was found to be phosphorescent hexagonal blende.—M. Becquerel gives particulars of the lines, wave-lengths, &c.—Note on paralldol, a polymeric modification of aldol, by M. Wurtz.—Second note on the reduction of demonstrations to their most simple and direct form, by M. de Saint-Venant.—Theory of the modification of branches to fulfil different functions, deduced from the constitution of the Amarylidae, &c., by M. Trecul. Branches may be divided into the terminated or definite, and the non-terminated or indefinite. The definite branches are the leaves, stipules, spaths, bracts, sepals, petals, stamens, and styles, or stigmatic divisions. The indefinite branches are the roots or subter-

anean branches and the adventitious, the aerial branches properly so-called, the peduncles, the receptacular cups, the ovaries, and lastly the ovules.—Reply of M. Hira to the critique of M. Ledien in *Comptes Rendus* of July 10.—On the flowering of *Cedrela sinensis* at the Museum, by M. Decaisne. A Chinese tree.—M. Milne-Edwards referred to the loss sustained by the Academy in the death of M. Ehrenberg, who was one of the Foreign Associates on June 27 last.—On the production of electric effluvia, by M. Boillot. Two modifications of apparatus formerly described.—Photometric researches on coloured flames, by M. Gray. He describes a new method.—Note on the radiometer, by M. Gaiffe. He makes one with the vanes painted dull-blue on one side, dull-red on the other; it will turn either way according to the source of light and heat. Solar rays move it one way, a gas flame or radiation from a heated iron plate sends it the opposite.—On radiometers with vanes formed of different matters, by M. M. Alvergnet Bros. No. 1 had vanes of silver and transparent mica; No. 2, aluminium and blackened mica; No. 3, aluminium and unblackened mica; No. 4, a radiometer weighing altogether 600 mgr.; No. 5, silver and aluminium; Nos. 6, 7, 8, mica and varnished copper, green, blue, red, and yellow. Effects are described.—On the cause of movement in the radiometer, by M. Sulet. He supposes it to be a difference of temperature in the faces of the vanes. A radiometer with magnetic needle retained an invariable position of deflection four days, the light source remaining constant. Action of condensed gases cannot be admitted here. Decomposition of alkaline bicarbonates, moist or dry, under the influence of heat and vacuum, by M. Gautier.—Photographic inscription of the indications of Lippmann's electrometer, by M. Marey. The opacity of the mercury column is utilised to obstruct, to a variable extent, a slit through which light passes to the photographic screen. The electrometer is somewhat modified. M. Marey shows the curves got from variation of the electromotive force in the heart of a tortoise and that of a frog.—On the existence of alterations in the peripheric extremities of cutaneous nerves in a case of pemphigoid eruptions, by M. Dejerine.—On the physiological theory of fermentation, and on the origin of zymases (soluble ferments), *apropos* of a note of MM. Pasteur and Joubert on the fermentation of urine, by M. Bechamp.—On the malacologic fauna of the islands St. Paul and Amsterdam, by M. Velain.—On the reproduction of dioic Volvox, by M. Henneguy. Sexuality appears by slow degrees, the male sex before the female, in proportion as the species is exhausted by a sexual reproduction.—On the geological age of some metallic veins, and especially veins of mercury, by M. Virlet d'Aoust.—On the photography of colours, by M. Cros.—On the vertical column observed above the sun on July 12, by M. Guillemin.—M. Larrey presented an Italian memoir by Dr. Minich, "On the antiseptic cure of wounds, and a new mode of dressing." He (Dr. Minich) prefers sulphite of soda to phenic and salicylic acid.

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ERRATUM.—Vol. xiii. p. 155, col. 1, line 15 from bottom, for "mile" read "rule."